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Using DSM data for modeling wind erosion events - bridging the gap between DSM and DSRA

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The Soil Thematic Strategy - adopted in September 2006 by the EC - is in its political discussion process with the primary goal of soil protection and soil sustainability. Wind erosion is one of the threats for soil outlined in there. DSM with its quantitative prediction of uncertainty has distinctive power for assessing soil relatively to environmental issues (called Digital Soil Assessment). In the paper it is applied for the prediction of wind erosion events using daily long term time series of meteorological data for the last 30 years.

A regression kriging (RK) simulation approach used 1200 profile observations together with information on parent material, DEM - and remote sensing parameters to estimate clay, silt and sand content (in %) and its related uncertainty for the area of Czech Republic. Texture class percentages have been derived in four different ways: 1) using the Dominant Soil Surface Texture of the European Soil Database (ESDB); II) using the estimated texture based on the RK, III) as well a Best Case - and IV) Worst Case (minimum clay, maximum sand content) scenario especially tailored for wind erosion. Based on these texture scenarios, we tested the applicability of DSM for doing Digital Soil Assessment (wind erosion modelling).. The wind erosion aggregate stability (ASEAGS) has been derived using a pedotransfer rule for the four different texture scenarios. In the second, third and fourth applications the number of

erosive days on bare agricultural soil was computed based on the Wind Force Integral, adding two climate data sets: daily wind speed, precipitation and evaporation data for 1961-1990 and for a climate scenario 2071-2100.

The first step, concerning the aggregate stability (ASEAGS) shows clear differences between ESDB dataset (Mean 2.83/Standard deviation 0.8) and RK dataset (Mean3.1, STD 0.35). Lower and upper limits of clay content show severe differences for each single location, which are not possible to estimate with the ESDB dataset. The consequences of those different ASEAGS numbers are amplified in the second step, where the number of Erosive days for a climate scenario was tested. ESDB and Worst Case-Scenario deliver similar numbers of ED, whereas the RK dataset shows a reduction to one/fourth of the number of EDs. The climate scenarios allow for the forecast that areas in eastern CZ will be more prone to wind erosion events in the future, whereas an overall decrease can be observed. Inclusion of DSM techniques in environmental modelling algorithm needs the modellers to understand soil processes as well as soil data. A combination of different datasets (soil, meteorological, land use) in DSA allows not only for the outlining risk areas, even better it gives policy making information with relevant significantly uncertainties.